

High-Resolution Transmission Electron Microscopy of Nanoparticles and Nanotubes Statement of Work

SCOPE: NASA Langley Research Center has a need to analyze nanoparticles and nanotubes produced by various methods including chemical synthesis and chemical vapor deposition. The service required to analyze these nanoparticles and nanotubes consists of high-resolution transmission electron microscopy (HR-TEM) for structural analysis, and in-situ energy dispersive spectroscopy for chemical analysis (EDS).

REQUIREMENT: The HR-TEM analyses shall have a point resolution of 0.23 nm, lattice resolution of 0.1 nm, and STEM (scanning TEM) resolution of 2 nm. The analyses shall have a 5-axes microactive goniometer stage with specimen tilting capability of $\pm 35^\circ$ on the X direction and $\pm 30^\circ$ on the Y direction. The various modes of operation shall include bright field imaging, dark field imaging, selected area diffraction, nano-beam diffraction, and STEM. Analyses shall require EDS with *in situ* chemical analysis using point analysis, line analysis, and elemental mapping modes. The estimated total number of nanoparticles and nanotubes samples for HR-TEM characterization will be 60 samples, 30 of these samples will also be characterized using EDS.

GOVERNMENT PROVIDED SAMPLES: Sample preparation shall be conducted by a NASA Langley Research Center representative and the samples shall be mounted on 3-mm transmission electron microscopy grids. The representative shall consult with the contractor on best methodologies to acquire HR-TEM images and EDS data. It is required that a technical representative from the NASA Langley Research Center be present during these analyses.

DELIVERABLE: The results shall be provided to NASA as images and spectra in digital format.

PERIOD OF PERFORMANCE: One (1) year from date of award